countries, these and many like facts we may allow. But we would be glad for them to study the history of Western inventions, and show a willingness to recognize the ingenuity, knowledge, and intellectual power of other nations wherever they are found. Let them also enter on a rivalry in inventions. Let them make new discoveries and advance in the arts in new ways such as may be of benefit in the world. The Western nations will not be slow to acknowledge any efficient aid they may give in science, politics, or the arts."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Nearly twenty courses of scientific and medical instruction for medical students will be carried on in the Long Vacation, including, besides chemical, botanical, anatomical, and physiological courses, Dr. Anningson and Mr. Robinson on the examination of water, air, and foods, chemically and microscopically, and Prof. Roy and Mr. Adami on pathology, morbid histology, and bacteriology.

The Museums and Lecture Rooms Syndicate have recommended the erection of the buildings required for human anatomy, together with the joint anatomical and physiological lecture-room, at a cost which will fall within the £10,000 reported to be available for the purpose.

The honorary degree of Doctor in Science has been conferred on Prof. Mendeleeff, of St. Petersburg; and the honorary M.A. on Baron A. von Hügel, Curator of the Museum of Archæology here.

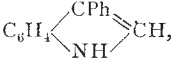
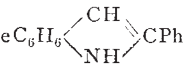
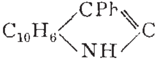
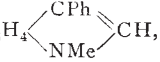
The Senior Wrangler, Mr. G. T. Walker, and Messrs. Dyson and Gaul, bracketed Second Wranglers, are all members of Trinity College.

In the second part of the Mathematical Tripos, Messrs. Brunyate, of Trinity, and Orr, of St. John's, have been placed in the first division of Class I., in alphabetical order; and Messrs. Buchanan, of Peterhouse, and Sampson, of St. John's, in the second division of the first class.

The Moral Sciences Tripos seems in a state of rapid progress towards obliteration. This year one first class and one second class represent the men; and this is but natural, for the range of work is such as to task the energy and thoughts of a matured thinker.

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, May 16.—Dr. W. J. Russell, F.R.S., President, in the chair.—The following papers were read:—The magnetic rotation of nitrogen compounds, by Dr. W. H. Perkin, F.R.S. In previous communications the author has shown that in the magnetic field the plane of polarization of light is rotated to a greater extent in unsaturated than in saturated carbon compounds, and it is now shown that in the case of nitrogen compounds the magnetic rotation is in like manner correlated with changes in the valency of the nitrogen. From the discussion of his results generally the author concludes that in compounds of unsaturated triad nitrogen, the nitrogen has a greater influence than when it is present in the saturated condition, the difference in the values being about 0·5; this is only about half the difference usually observed on comparing the rotations of carbon compounds differing by two atoms of hydrogen. In the discussion which followed the reading of the paper, Dr. Gladstone, F.R.S., said that the general result of Dr. Perkin's work, establishing a difference in nitrogen according as it is present in the saturated or unsaturated condition, was in accordance with the conclusion which he had arrived at from the study of refractive power; the peculiarities brought out by the study of the magnetic behaviour, however, were chiefly indicated by peculiarities in dispersive power, being less obvious in the refraction equivalents.—The nature of solutions as elucidated by a study of their densities, electric conductivities, heat capacity, and heat of dissolution, by Mr. S. U. Pickering. The solutions examined were those of calcium chloride, calcium nitrate, and sulphuric acid, and the various hydrates which are proved to exist in solution are numerous and complex. The hydrates which calcium chloride forms contain 6, 7, 8, 10, 13, 18, 28, 86, and 1500 H_2O; calcium nitrate gives hydrates with 3, 3·5, 4·5, 5, 6, 10, 17, 51, 265, and 1810 H_2O; while with sulphuric acid hydrates are found containing $\frac{1}{6}$, $\frac{1}{3}$, $\frac{2}{3}$, 1, $\frac{3}{2}$, 2, 4, 5, 9, 13, 24, 52, 135, 510, 1430, and 4950 H_2O. The existence of these is, naturally, more doubtful in some cases than in others, and it is impossible to determine the exact molecular composition when more than about $10H_2O$ is present. In some cases the hydrates of sulphuric acid were established by six independent sets of results obtained from the study of four distinct properties. The excessively large amount of water present in the highest hydrate is a matter of especial interest, and the existence of such compounds explains the influence which mere traces of one substance may have on another substance (*e.g.* impurities in metals). The final conclusion which the author deduces from his work is the absolute rejection of any theory of dissolution other than the hydrate theory.—The expansion of water and other liquids, by the same. The author gives some determinations of the density of water at different temperatures, which indicate sudden changes in the expansion at about 10° and 18°. On examining the results obtained by Pierre, Kopp, Rosetti, Matthiessen, Solly, Despretz, and Hagen, he obtained further evidence of these changes, as well as of another change at 50°-60°. Pierre's results also show marked changes at 0° and 2°·5. Pierre's results with eleven organic liquids were also examined, and in most of them there appeared to be sudden changes of density at certain temperatures, which temperatures were different for different liquids. Nearly all of these results show that the densities of liquids when plotted against temperature form a series of parabolic curves of the second order, not meeting tangentially, and differentiating, therefore, into a series of straight lines which do not meet at the points where the breaks occur.—The formation of phenylindoles by isomeric change, by Dr. W. H. Ince. It is known that the phenylindole  $C_6H_4\left\langle\begin{matrix}CPh\\NH\end{matrix}\right\rangle CH$, when heated with zinc chloride at 170°, is converted into the isomeride  $C_6H_6\left\langle\begin{matrix}CH\\NH\end{matrix}\right\rangle CPh$ (Fischer and Schmitt, *Ber. der deut. chem. Gesellsch.*, 1887, 1071, 1811). The author finds that the corresponding naphthindole,  $C_{10}H_6\left\langle\begin{matrix}CPh\\NH\end{matrix}\right\rangle CH$, and methylphenylindole,  $C_6H_4\left\langle\begin{matrix}CPh\\NMe\end{matrix}\right\rangle CH$, undergo a like change under similar conditions, although action takes place neither so easily nor so completely as in the simpler case.—An improved Soxhlet extractor, and vacuum distilling apparatus, by Dr. I. Lewkowitsch.

Institution of Civil Engineers, May 28.—Annual General Meeting.—Sir George B. Bruce, President, in the chair.—After the reading and adoption of the Report, hearty votes of thank were passed to the President, to the Vice-Presidents, and other Members of the Council, to the Auditors, to the Secretaries and Staff, and to the Scrutineers.—The ballot for the Council resulted in the election of Sir John Coode, K.C.M.G., as President; of Mr. G. Berkley, Mr. H. Hayter, Mr. A. Giles, M.P., and Sir Robert Rawlinson, K.C.B., as Vice-Presidents; and of Mr. W. Anderson, Mr. B. Baker, Mr. J. W. Barry, Mr. E. A. Cowper, Sir James N. Douglass, F.R.S., Sir Douglas Fox, Mr. J. C. Hawkshaw, Mr. C. Hawksley, Sir Bradford Leslie, K.C.I.E., Mr. G. F. Lyster, Mr. J. Mansergh, Mr. W. H. Preece, F.R.S., Sir E. J. Reed, K.C.B., F.R.S., M.P., Mr. W. Shelford, and Mr. F. W. Webb, as other Members of the Council.—The session was then adjourned until the second Tuesday in November, at 8 p.m.—The Council have awarded the following premiums in respect of the original communications submitted during the session 1888-89:—For papers read and discussed at the ordinary meetings: a Telford Medal and a Telford Premium to Gisbert Kapp, for his paper on alternate-current machinery; a Watt Medal and a Telford Premium to William Henry Greenwood, for his paper on the treatment of steel by hydraulic pressure, and the plant employed for the purpose; a George Stephenson Medal and a Telford Premium to Edgar Worthington, for his paper on the compound principle applied to locomotives; a Watt Medal and a Telford Premium to Charles Edward Emery, for his paper on the district distribution of steam in the United States; a Telford Premium to John Audley Frederick Aspinall, for his paper on the friction of locomotive slide-valves; a Telford Premium to John Oliver Arnold, for his paper on the influence of chemical composition on the strength of Bessemer steel tires. For papers printed in the Proceedings without being discussed: a Watt Medal and a

Telford Premium to Robert Runeberg, for his description of steamers for winter navigation and ice-breaking; a Telford Premium to Bryan Donkin, Jun., for his account of experiments with gas-flame jackets; a Telford Premium to Prof. Victor Auguste Ernest Dwelshauvers Dery, for his reduction of experiments on the effect of superheating, steam-jacketing, and gas-flame jackets on cylinder-condensation; a Telford Premium to Robert Henry Smith, for his paper on stress diagrams of solid structures; a Telford Premium to Leveson Francis Vernon-Harcourt, for his paper on Alpine engineering; a Telford Premium to George Lopes, for his account of the reparation of Betchworth Tunnel, Dorking, on the London, Brighton, and South Coast Railway; a Telford Premium to Neil Kennedy, for his paper on the tacheometer and its uses. For papers read at the supplemental meetings of students: a Miller Scholarship to Edward Carstensen de Segundo, for his account of experiments on the strain in the outer layers of cast-iron and steel beams; a Miller Prize to Henry Byrom Ransom, for his paper on the cyclical velocity-variations of steam and other engines; a Miller Prize to William Wade Fitzherbert Pullen, for his account of water-softening and filtering apparatus, for locomotive purposes, at the Taff Vale Railway Company's Penarth Dock Station, near Cardiff; a Miller Prize to James Denis Twinberrow, for his paper on flexible wheel-bases for railway rolling-stock; a Miller Prize to Samuel Joyce, Jun., for his paper on electrical measuring-instruments, their properties and calibration; a Miller Prize to Richard John Durley, for his paper on moulding and casting cylinders for marine engines; a Miller Prize to Julian James King-Salter, for his description of the 26-knot Spanish torpedo-boat *Ariete*; Miller Prizes to Charles Henry Gale and Vernon Warburton Delves-Broughton, for their joint paper on photography for engineers.

Geological Society, May 22.—Mr. W. T. Blanford, F.R.S., President, in the chair.—The following communications were read:—Note on the hornblende schists and banded crystalline rocks of the Lizard, by Major-General C. A. McMahon. The reading of this paper was followed by a discussion, in which the President, Dr. Geikie, Mr. Teall, Prof. Bonney, Mr. Rutley, and Dr. Hicks took part.—The Upper Jurassic clays of Lincolnshire, by Mr. Thomas Roberts. In Lincolnshire it has generally been considered that the Oxford and Kimeridge clays come in direct sequence, and that the Corallian group of rocks is not represented. The author, however, endeavoured to show that there is between the Oxford and Kimeridge a zone of clay which is of Corallian age. Six palæontological zones were recognized in the Oxford clay. The clays which come between the Oxford and Upper Kimeridge the author divided into the following zones: (1) black selenitiferous clays; (2) dark clays crowded with *Ostrea deltoidea*; (3) clays with *Ammonites alternans*; and (4) clays in which this fossil is absent. The black selenitiferous clays (1) are regarded as Corallian, because: (*a*) they come between the Oxford clay and the basement bed of the Kimeridge; (*b*) out of the twenty-three species of fossils collected from this zone, twenty-two are Corallian; (*c*) *Ostrea deltoidea* and *Gryphæa dilatata* occur together in these clays, and also in the Corallian, but in no other formation. The zones (2), (3), and (4) are of Lower Kimeridge clay age. The lowest zone, (2), is very persistent in character, and is met with in Yorkshire, Cambridgeshire, Oxfordshire, and the south of England. The remaining zones, (3) and (4), are local in their development. Some remarks on this paper were offered by Prof. Blake and Mr. Hudleston.—Origin of movements in the earth's crust, by Mr. James R. Kilroe. Communicated by Mr. A. B. Wynne.

Zoological Society, May 21.—Prof. Flower, F.R.S., President, in the chair.—Mr. Sclater exhibited and made remarks on a mummied Falcon from Egypt; and some photographs of groups of Sea-birds and Seals taken on the shores of Antipodes Island, Antarctic Ocean.—Mr. Sclater also called attention to a specimen of Leaf-insect, living in the Society's Insect House, which had been received from the Seychelles, and presented by Lord Walsingham. It was not quite fully developed, but was believed to be referable to *Phyllium gelonus*, Gray.—Mr. Martin Jacoby read a list of the species of Coleoptera of the families Crioceridæ, Chrysomelidæ, and Galerucidæ, of which specimens had been collected in Venezuela by M. Simon, and gave descriptions of the new species.—A communication was read from Mr. A. G. Butler containing the description of a new extinct genus of Moths belonging to the Geometrid family Euschemidæ, based on a fossil specimen obtained from the Eocene Freshwater Limestone of Gurnet Bay, Isle of Wight. This insect was named *Lithopsyche antiqua*.—Mr. W. F. Kirby read a paper containing descriptions of new genera and species of Dragonflies in the collection of the British Museum, chiefly from Africa.—Dr. Hans Gadow read a paper on the taxonomic value of the intestinal convolutions in birds. After pointing out the different forms assumed by the intestinal convolutions in this class of animals, and suggesting a nomenclature for them, the author proceeded to give the outlines of a classification of birds based solely on this part of their structure, and to show the differences and resemblances of the various groups.

EDINBURGH.

Royal Society, June 3.—Sheriff Forbes Irvine, Vice-President, in the chair.—Some photographs of mirage were exhibited.—Prof. T. R. Frazer communicated the remainder of his paper on the natural history, chemistry, and pharmacology, of *Strophanthus hispidus*.—Prof. Tait read a note on the compressibility of mercury.—Dr. E. Sang gave a notice of fundamental tables in trigonometry and astronomy arranged according to the decimal division of the quadrant.—Prof. Tait communicated a note on the inscription, in a sphere, of a closed polygon, each of whose sides shall pass through a given point, and he also discussed the problem of the non-oscillating pendulum.—A paper, by Sir W. Thomson, on the Bravais' uniform distribution of points, was submitted.

PARIS.

Academy of Sciences, June 3.—M. Des Cloizeaux, President, in the chair.—Heat of combustion of carbon under its various forms of diamond, graphite, and amorphous carbon, by MM. Berthelot and Petit. By means of the new methods based on the employment of the calorimetric bomb, the authors have determined the molecular heat of combustion of amorphous carbon at 97·65 calories; of crystallized graphite at 94·81; of the diamond at 94·31; and of bort (uncleavable diamond) 94·34. The old values, hitherto accepted, must consequently be considerably increased, and this again involves an increase of the heats of formation for all organic compounds, from their elements upwards, so far as they have yet been calculated.—Note on the spectrum of Uranus, by Mr. J. Norman Lockyer.—On the surface-currents of the North Atlantic, by Prince Albert of Monaco. Of the 1675 floats cast into the sea during the recent explorations of the *Hirondelle*, as many as 146 have already been recovered at various points of the seaboard, apparently demonstrating a circular movement of the surface-waters round a point situated somewhere to the south-west of the Azores. The outer edge of this current sets east-north-east to the neighbourhood of the English Channel, where it is deflected southwards along the coasts of Europe and Africa to the Canaries, thence trending south east to the equatorial current, thus completing the circuit by merging in the Gulf Stream. —On Prof. Charles Sumner Tainter's graphophone, by M. Georges R. Ostheimer. The essential feature of this instrument, which solves the problem of the storage of sound, is the employment of wax, or a pasteboard cylinder coated with wax. The process, devised by Prof. Tainter after the original phonograph had been discarded by Mr. Edison as of no immediate practical utility, has since been so highly approved of by the American inventor that he has adopted it for what he now calls his "improved phonograph."—Observations of the new planet discovered on May 29 at the Observatory of Nice, by M. Charlois. The observations are for the period May 29-31, when the planet appeared to be of the twelfth magnitude.—On the stability of the solar system, by M. D. Eginitis. The authors here study the nature of the slight perturbations usually neglected in planetary theories, and endeavour to determine their more important general analytical forms. The results are given for the earth and Saturn, showing that the long axes of their orbits are subject to extremely slight secular perturbations of the third order. These irregularities are periodical, the periods being excessively long, but of such a nature as to imply that both Saturn and the earth are at present approaching the sun.—Apparatus for determining melting-points under ordinary conditions and variable pressures, by M. B. C. Damien. The apparatus here described will be found useful in determining the melting-points of various mixtures of spermaceti and ether, of gum-lac and alcohol, and in general of solidified solutions of various solids.—The electric conductivity of saline solutions, applied to the problems of chemical mechanics, by M. P.

Chroustchoff. In continuation of his previous paper on this subject the author here gives in tabular form the measurements of the conductivity of neutral saline mixtures capable of double decomposition. In a supplementary paper, MM. Chroustchoff and V. Pachkoff deal with the electric conductivity of saline solutions containing mixtures of neutral salts. The chief object of this research is to confirm by experiment the assumption that a partial formation of double salts in solutions is a general phenomenon. — On some substances derived by polymerization from ethyl cyanide, by MM. M. Hanriot and L. Bouveault. The preparation and properties are described of two bodies of which the formulæ are respectively $C_2H_5 . CO . C(CH_3)_2CN$ and $C_2H_5 . CO . C(C_2H_5)(CH_3)CN$, the former obtained by the action of methyl iodide, the latter by that of ethyl iodide.—On some rocks of the Maures district, by M. A. Le Verrier. Of the old eruptive rocks here described the most interesting is a lherzolite consisting of olivine and hypersthene (labrador schiller spar), the first associated with serpentine, the second with talc.—On the toxic property of meteoric waters, by M. Domingos Freire. An epidemic presenting some hitherto unknown symptoms having broken out at Rio de Janeiro last March, the author, with a view to determining its origin, made some experiments on the character of the aqueous vapour suspended in the atmosphere. The result of these experiments was a strong suspicion, if not certainty, that the disorder was due to a toxic principle diffused in the atmosphere, and belonging perhaps to the cyanic series (hydrocyanic acid?).—Papers were contributed by M. G. André, on some ammonio-chlorides of mercury; by M. E. Péchard, on the combinations of metatungstic acid with the alkaline bases and the resulting thermic phenomena; by M. Léon Bourgeois, on the preparation of the crystallized orthosilicates of cobalt and nickel; by M. Trouessart, on the marine Acarians of the French seaboard; by M. Flammarion, on the earthquake of May 30; and by M. Th. Moureaux, on the possible connection of magnetic disturbances with the same earthquake.

BERLIN.

Physical Society, May 24.—Prof. du Bois Reymond, President, in the chair.—Prof. Börnstein exhibited a photograph which he had taken during the recent heavy thunder-storms. Two flashes could scarcely be distinguished on the photograph owing to the marked occurrence of sheet lightning; they appeared as simply very sinuous lines without any zig-zags.—Dr. Pringsheim had carried out a series of researches with the phonautograph in order to determine by physical methods upon what the French accent is dependent, whether it is due to the duration, pitch, or intensity of the tones. Several Frenchmen spoke single words and short sentences slowly into the funnel of the instrument so as to impinge upon a membrane, made of the thinnest india-rubber, whose vibrations were recorded on a smoked rotating drum by means of a fibre of glass. The somewhat troublesome analysis of the minute curves brought to light very characteristic waves for the consonants, but these differed considerably according as they were spoken at the beginning or end of a word. The vowels showed a considerable difference from the consonants chiefly in respect of their pitch. The speaker exhibited and explained a number of the curves; but further researches are necessary before any general conclusions can be arrived at, or the question as to the real nature of "accent" can be decided.—Dr. Dieterici gave an account of his researches on the determination of the specific volume of saturated aqueous vapour at 0° C. On account of the difficulties which presented themselves in connection with the measurements necessary in the methods of research hitherto employed, he had devised a new method. He measured the amount of water which must be converted into vapour at 0° C. in order to completely fill a known space with saturated vapour, by means of the heat which becomes latent during its evaporation. The vessel containing the water was immersed in an ice-calorimeter, and was connected with a large space which could be rendered both vacuous and dry. The water, or dilute saline-solution which behaves like water, was then allowed to evaporate until the space was filled with saturated vapour; the amount of heat requisite to produce the observed evaporation was determined from the amount of mercury which was expelled from the calorimeter, and this then gave the amount of water evaporated. From among the experimental details, which the speaker described in full, the only points which may here be mentioned are that a small residual quantity of air in the vacuum has no effect on the total amount of water which evaporates, but only slows the rate of evaporation to a slight extent; on the other hand, the pellicle of water which is condensed on the inner surface of the vacuous space was found to exert a quantitative influence on the evaporation, and necessitated special modifications of the methods of experiment for its exclusion. As one outcome of the experiments may be mentioned that Gay Lussac's law holds good almost up to the temperature of saturation, and that the mass of water which must be evaporated in order to saturate a space of 1 litre capacity at 0° C. is 4·886 mgr.; hence the specific volume of aqueous vapour saturated at 0° C. is 204·7 litres, and its pressure is 4·62 mm. The speaker had deduced a considerable number of other important constants from the results of his experiments; and he further intends to determine the above for other fluids and at other temperatures in a subsequent research.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

An Essay on Asphyxia: G. Johnson (Churchill).—The Working and Management of an English Railway: G. Findlay (Whittaker).—Scientific Memoirs by Medical Officers of the Army of India, Part 4, 1889: edited by Sir B. Simpson (Calcutta).—Método de los Cuadrados Minimos: Libro de Texto por M. Merriman; traducido del Inglés por V. Balbin (Buenos Aires, Biedma).—Blackie's Modern Cyclopedia, vol. ii. (Blackie).—Life Lore, vol. i. (Mawer).—Kant's Critical Philosophy, a new and completed edition, vol. i., the Kritik of Pure Reason Explained and Defended: J. P. Mahaffy and J. H. Bernard (Macmillan).—An Elementary Treatise on Heat: H. G. Madan (Rivingtons).—Transactions of the Linnean Society of London, vol. v., Part 3, the Zoology of the Afghan Delimitation Commission: J. E. T. Aitchison (Longmans).—A Grammar of the Kwagiutl Language: Rev. A. J. Hall (Montreal, Dawson).—Rapporteur Esthétique: M. C. Henry (Paris, Seguin).—Cercle Chromatique: M. C. Henry (Paris, Verdin).—The Mineral Wealth of British Columbia: G. M. Dawson (Montreal, Dawson).

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